

NASA TECH BRIEF

Lyndon B. Johnson Space Center



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Repair of Damaged Insulation Tiles

The problem:

High-temperature, reusable, surface insulation (HRSI) tiles are used for thermal protection of structures in extreme temperature environments. The tiles are made from high-purity, amorphous silica fibers that are cast into tile shape and have specific orientation. This fragile material chips and breaks easily, and the damaged tiles must normally be replaced with new ones.

The solution:

Damaged tiles may be repaired more quickly and economically, using prefabricated tile plugs.

How it's done:

The prefabricated tile plugs are made from the same material as the tiles and may be cut to a number of shapes as shown in Figure 1. The damaged tile area is cut to match any one of these shapes. The area is treated with a chemical to obtain a strong bond, and the plug is inserted, using an appropriate cement.

Figure 2 shows two tiles in which the damaged areas have been removed with a diamond holecutter and a radiac wheel. To prepare the tiles for repair, all of the corners have been rounded to prevent further cracking, and a depth-gage scraper has been used to remove the silica fibers to the desired depths. At this point, the cavities in the tiles are ready to be plugged up.

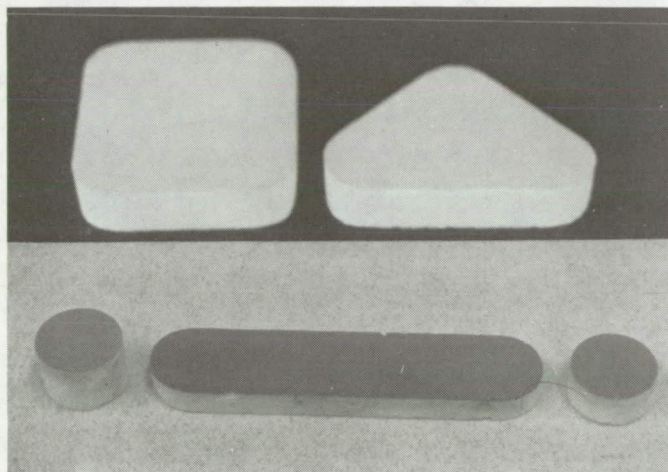


Figure 1. Prefabricated Plugs

(continued overleaf)

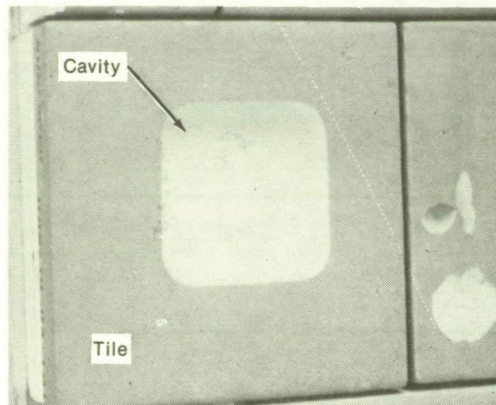
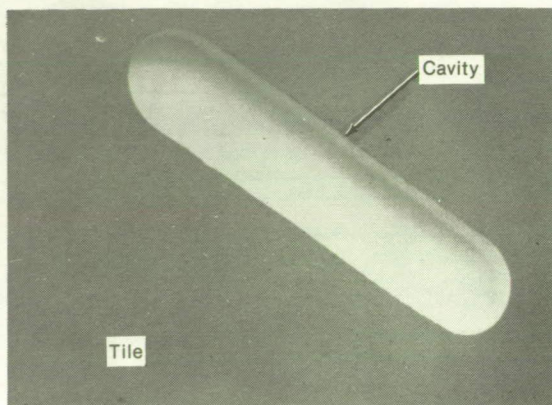


Figure 2. Typical Completed Cavities

The first step is to test the fit of the plug by a trial insertion into the cavity. The plugs are then removed, and the cavity area is treated with silane to remove the waterproofing agent within the tile material. This is necessary for the next step in which a fused-silica aqueous-based adhesive is applied to the faying surfaces and the plug inserted into the cavity. The adhesive bonds to the tile material only when the waterproofing agent is removed. Tests have shown that this type of repair can withstand temperatures of 2,200° F (1,477 K) for more than 24 hours.

Notes:

1. Additional information on HRSI tiles may be found in the following NASA Tech Briefs:
B75-10042, High-Temperature, Reusable Surface Insulation.
B75-10104, Method of Attaching Insulation Tiles.
2. Requests for further information may be directed to:

Technology Utilization Officer
Johnson Space Center
Code AT3
Houston, Texas 77058
Reference: TSP75-10321

Patent status:

NASA has decided not to apply for a patent.

Source: D. Mui of
Rockwell International Corp.
(MSC-19549)